

the following extract from the translation of his paper on the *Cystidea** will prove:—

“Mr. Austin states that *Sycocrinites* exhibits three dorso-central plates,” &c. (see Annals of Nat. Hist. vol. xi. p. 206). “This is manifestly the description of a *Cryptocrinite* (so named in 1840); but this author does not state the locality of his specimen,” &c.

I will only add, that *Cryptocrinus* is a genus arranged with Von Buch’s family of *Cystidea*, and that it does not appear to belong to a group along with *Pentremites*.

August 9th, 1851.

XXIII.—*Descriptions of two new species of Nudibranchiate Mollusca, one of them forming the type of a new Genus.* By JOSHUA ALDER and ALBANY HANCOCK. *With the Anatomy of the Genus,* by ALBANY HANCOCK.

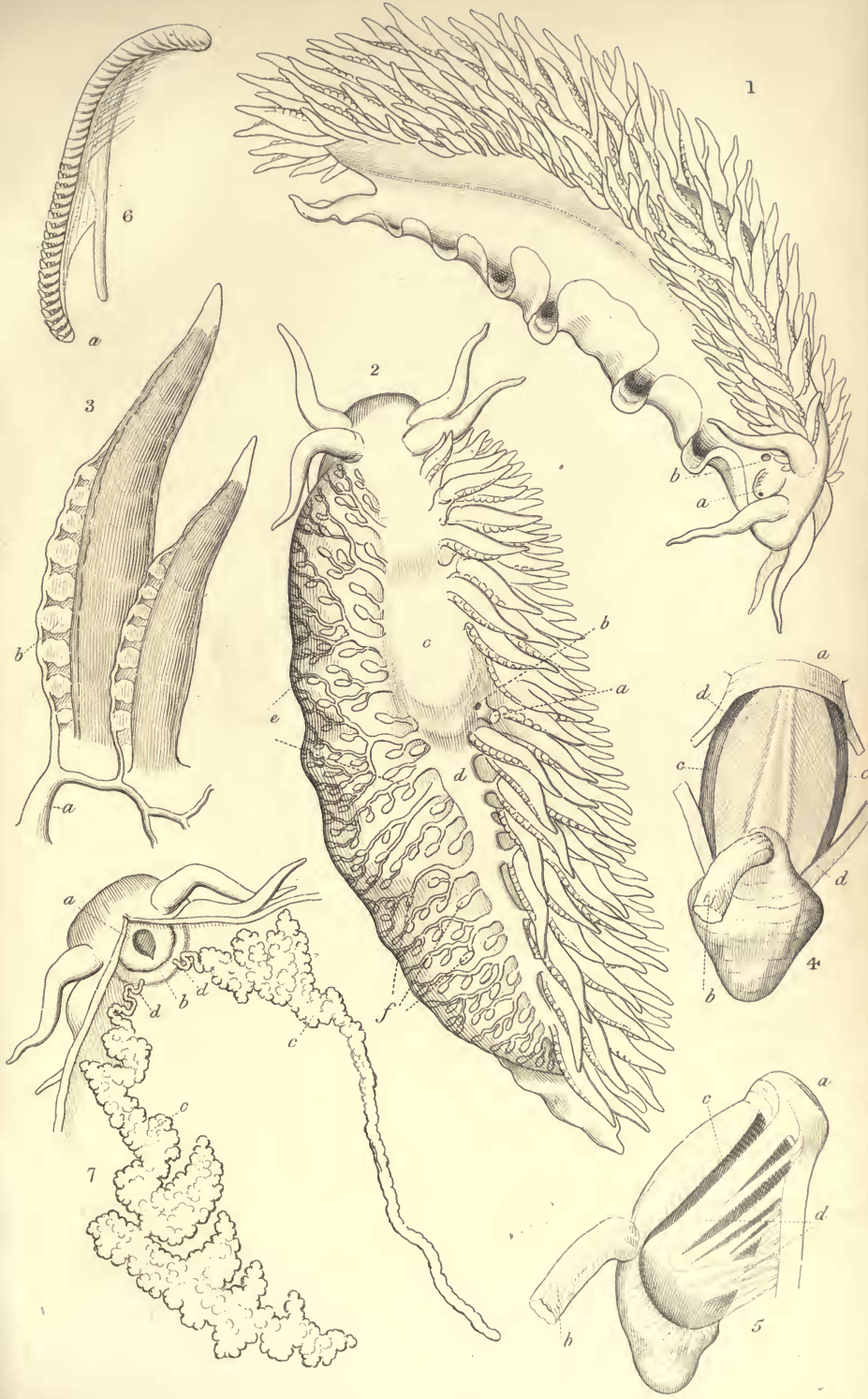
[With two Plates.]

THE Nudibranchiate Mollusks, which we have now the pleasure of introducing for the first time to the notice of naturalists, we owe to the persevering researches of our friend Mr. W. P. Cocks of Falmouth, by whom they have been communicated to us, with kind permission to publish descriptions of them. The first species we shall notice we refer to the *Thecacera* of Fleming, a genus at present so imperfectly understood that any addition to our knowledge of its characters may be considered as furnishing a desideratum in this family of the Mollusca. We propose to characterize it as follows:—

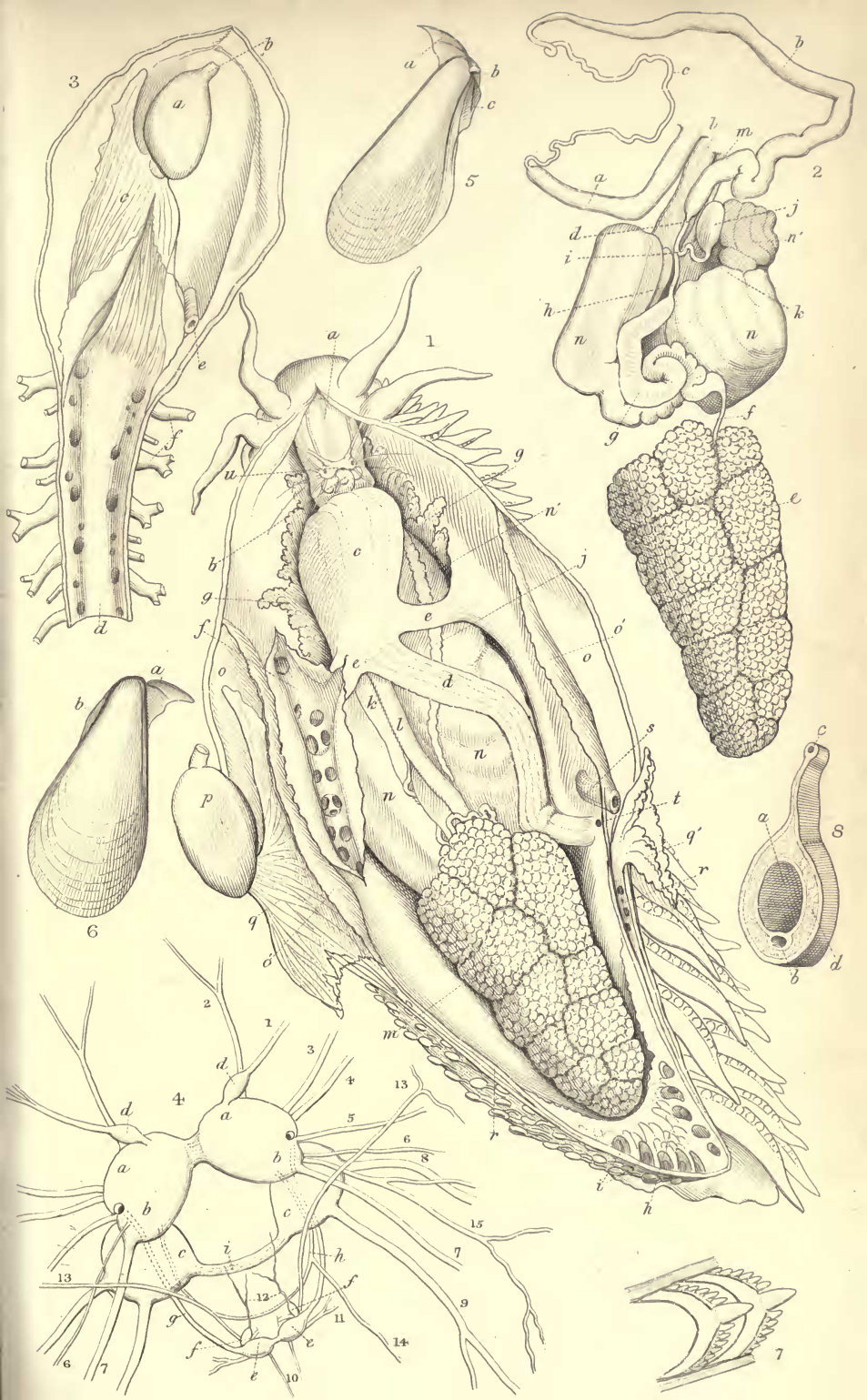
Thecacera virescens. Body rather convex, smooth, of a light peach-blossom tint, blotched with green anteriorly and posteriorly. Head with a plain subvelar margin in front. Tentacles broadly laminated, the laminated portion green, the lower or smooth portion of the same colour as the body; they are retractile within moderately-sized sheaths with smooth margins. Branchial plumes five, green, margined with white. A single row of obsolete tubercles encircles the branchial region. Foot of a dull yellowish white. Length $\frac{5}{10}$ ths of an inch.

This beautiful little animal differs in several respects from the *Doris pennigera* of Montagu, which is the type of the genus *Thecacera*, and might by some naturalists be thought entitled to rank as a new genus; we prefer, however, to consider it an ab-

* A translation of this paper appeared in the Journal of the Geological Society, Feb. 1st, 1846.









normal form of *Thecacera*, with which it agrees in the sheathed tentacles and the plain frontal veil without filaments or tubercles. It seems to bear much the same relationship to *T. pennigera* as *Polycera ocellata* and *P. Lessonii* do to *P. quadrilineata*:

Two specimens were found by Mr. Cocks in March 1849, at low-water mark on the oyster bed at Bar Point, Falmouth.

The next novelty we have to describe is still more interesting. It belongs to the family *Eolididæ*, but presents peculiarities that forbid its being associated generically with any known form of that family. It will be necessary therefore to establish for it a new genus.

OITHONA*, n. g.

Body elongated, limaciform; head with four linear tentacles, constituting two pairs, both subdorsal; the anterior pair, corresponding to the oral tentacles of *Eolis*, being situated considerably behind the lips. Mouth with corneous jaws. Branchiæ papillary, clothing irregularly a subpallial expansion on the sides of the back and meeting posteriorly; a produced membranous margin or fringe runs down the inner side of each papilla. Anus latero-dorsal, situated towards the right side. Orifices of the generative organs separate; situated below the tentacles on the right side.

This genus differs from *Eolis* in the anterior pair of tentacles not being placed on the lip, in the subdorsal position of the anus, and more especially in the curious frilled membrane that runs down the side of each branchial papilla. The papillæ are also much more firmly attached to the back than in *Eolis*, and the apertures of the sexual organs are disunited. The anatomy also shows several interesting points of divergence.

O. nobilis. Body pale buff or whitish, smooth; tentacles long, broad at the base, and tapering to a fine point at the apex; not wrinkled or laminated; both pairs nearly equal in length. Branchiæ very numerous and crowded, commencing behind the tentacles and set without apparent order on the sides of the back on a subpallial expansion which is considerably produced posteriorly. They are linear-conical and rather compressed, particularly towards the base; the lateral fringe wide and strongly waved: the central vessel is of a rich dark brown, the sheath and waved membrane of a transparent buff-colour: the apices have an iridescent or metallic lustre, which is observable also on the back. The foot is long and lanceolate, rounded in front and produced into a fine point behind; the margins thin. Length 2 inches.

* *Oithona* (the virgin of the wave), one of the heroines of Ossian.

Two specimens were found under a stone at Bar Point, Falmouth, together with some patches of spawn deposited on the surface of the stone. "When first taken," Mr. Cocks says, "the iridescent appearance of the back and the tips of the branchiæ was delightful." The tentacles were not carried erect, but projected horizontally "like the horns of a bull." The spawn was of a hemispherical form, composed of a broadish band of ova disposed in a single coil, and curved inwards above.

Unfortunately these beautiful creatures were killed during the first night after their capture by having been accidentally placed in a bottle that had contained quinine, and we thus lost the opportunity of seeing them in a living state.

Anatomy of Oithona, by Albany Hancock.

The anatomy of this animal amply proves its generic distinctness. Unfortunately we have not been able to go very minutely into the subject, having dissected only one of the two individuals captured; the other being preserved for external identification. We have, however, ascertained all the leading features with sufficient accuracy, and therefore confidently give the following account of them.

The tissues of *Oithona* are very tough and firm when compared with those of the other *Eolididæ*, particularly the skin and the cellular tissue uniting the viscera. Of course we are now speaking of the animal, after having been subjected to the hardening action of spirit. *Doto fragilis* is the only species, with which we are acquainted, that at all approaches to it in this respect. The branchial papillæ, too, are much more firmly attached than usual, and require considerable force to remove them.

The oral orifice is situated in the inferior surface of the head; it is small, and the external lip is divided behind on the median line much as in *Eolis*. The channel leading to the buccal apparatus is very short and constricted; and, just before it opens into that apparatus, receives on either side below, a very slender duct from a large, much folliculated, salivary gland (Pl. IX. fig. 7 c, c). These glands lie beneath the stomach and extend almost half-way down the body. That on the right side is considerably less than the other, and is somewhat tubular,—distinctly so towards its termination; the one on the left side is much complicated in form, being irregularly and extensively sacculated. The position of these glands is unusual: *Doto fragilis* is the only other species in which they open into the channel of the mouth in advance of the buccal mass.

The buccal mass (Pl. X. fig. 1 a & Pl. IX. figs. 4, 5) is small, rather long, slender, and irregularly elliptical, the corneous plates or jaws (Pl. IX. fig. 5 c) being visible at the sides: it is

slightly prolonged behind for the reception of the posterior portion of the tongue, and the muscles are arranged much as in *Eolis*. On the dorsal aspect they are extensively developed, forming a dense mass, the fibres passing transversely and having their extremities inserted into the dorsal margins of the plates. These muscles undoubtedly assist in the motion of the jaws. Those for moving the whole apparatus forward are composed of flattened, isolated bands with their extremities attached to the posterior margin of the plates and to the muscles forming the walls of the channel of the mouth.

The tongue is supported on a fleshy ridge that rises up from the floor of the buccal cavity, and extends in the antero-posterior direction from the œsophagus towards the anterior opening. This organ (fig. 6) is long, linear, and strap-formed, and is composed of forty transverse, semicircular plates (Pl. X. fig. 7) of an orange colour, each bearing a stoutish central spine and six or seven smaller ones at the sides; these latter having apparently a minute denticle at the base of their outer margin. All the spines are a little bent, and have their points directed backwards towards the œsophageal opening.

The corneous plates (Pl. X. figs. 5, 6) are little short of the size of the buccal mass, and much elongated, well arched and ovate; and, when united and entirely isolated, strongly resemble the valves of a minute *Mytilus*. They are smooth, glossy, and of a brownish amber colour, darkest towards the anterior extremity, which gives support to the cutting blade (*a*). This is a wing-like appendage of no great size, terminating below in a free point, and having the cutting margin arched forward, plain, and nearly at right angles to the general direction of the plate; above is a small process or fulcrum (*b*)—the point at which the two plates are articulated; and immediately behind this point the dorsal margin of the plates is reflected and expanded into an arched lobe (*c*) for muscular attachment.

The œsophagus (fig. 1 *b*) is a short and rather slender tube, which, passing from the upper aspect of the buccal mass towards its posterior extremity, opens into the anterior margin of a distinct pyriform stomach (*c*). This organ has the broad end forward, is placed above the reproductive apparatus, and lies quite in the anterior portion of the visceral cavity. The internal surface of the gastric organ does not appear to be lamellated. The intestine (*d*) passes from the posterior extremity of the stomach, and inclining slightly to the right side, passes backwards to the tubular anus (Pl. IX. fig. 2 *a*), which is placed a little to the right of the median line of the back, immediately behind the heart. The intestinal tube is rather short, of equal diameter throughout, and internally plicated longitudinally.

The hepatic apparatus is very peculiar in this animal. The pyloric extremity of the stomach receives two biliary ducts, one on each side of the intestine. These ducts or hepatic canals (Pl. X. fig. 1 *e, e*) are nearly as wide as the intestine, and, diverging as they leave the stomach, very shortly pass into the skin at the sides of the back, where each opens into a wide channel that extends nearly the whole length of the body. The channels receive numerous branches (*f*), which communicate with the glands of the papillæ, and as they approach the lateral expansion at the side of the body, they appear to be subdivided several times. The exact order of their subdivisions, however, was not determined; but as the papillæ have no definite arrangement, it is probable that these branches also are irregularly disposed. The anterior portions of the great hepatic channels are apparently connected with two folliculated glandular bodies (*g, g*), much and irregularly sacculated. These bodies are united to the skin, one on each side near the region of the stomach, and probably form the inner walls of those portions of the channels. Amidst the cellular tissue at the extremity of the body, behind the ovary, there is likewise a glandular substance (*h*), of a reddish colour, folliculated and apparently branched, in connexion with the branches of the hepatic canals (*i*) within the skin. These branches at the posterior portion of the body probably form a sort of network of tubes across the dorsal aspect. Such perhaps may be inferred from the appearance the branches present when the skin of the back is divided down the median line.

The arrangement of the hepatic canals differs from that which prevails in the *Eolididæ*. In *Eolis*, *Embletonia*, *Doto*, *Dendronotus*, *Lomonotus*, and *Antiopa*, the principal canals lie free in the visceral cavity, and in all of them there is a median posterior trunk. In this genus there is no such trunk, and the canals are almost entirely within the skin. In these respects *Oithona* would appear to resemble *Hermæa*, in which the whole of the hepatic ramifications are apparently connected with the skin, and there are only two principal trunks, which pass down the sides of the back. It is evident, however, that the digestive system alone sufficiently distinguishes *Oithona* from all the above genera, not even excepting *Hermæa*.

The hepatic glands are large, nearly filling the papillæ; they are slightly and irregularly sacculated, with the inner surface of the investing membrane lined with a dark granular substance; above, this substance is very abundant, forming a dense mass; below, the membrane in some of the papillæ is entirely devoid of it. We failed to detect any ovate vesicle like that of *Eolis* in the apex of the papillæ, neither have we been able to determine whether or not the apex is perforated.

Reproductive Organs.—There are two external orifices, one placed a little in advance of the other on the right side of the head between and a little below the tentacles. The one (Pl. IX. fig. 1 *a*) in front is for the exertion of the intromittent organ, the other (*b*) is rather small and is common to both the female and androgynous apparatus.

On laying open the dorsal skin, the reproductive organs are found as usual to occupy much of the visceral cavity, having the stomach and intestine lying above, and the buccal mass in front. The intromittent organ (Pl. X. fig. 2 *a*) is placed in advance of the other parts, and, in its retracted state, is long, rather slender, and linear; differing considerably from the usual conical form of this organ when in this state. The outer extremity leads through the wall of the visceral cavity to the external orifice, and on its way the sheath or external covering becomes firmly attached to the muscles of the skin. The testis (*b*), a stout flesh-coloured tube two or three times convoluted, tapers at one extremity into a long slender duct or vas deferens (*c*), which is united to the inner extremity of the penis. The other extremity of the testis suddenly contracts into an equally slender duct (*d*), but very much shorter, and is joined by this duct to the oviduct. The ovary (*e*) fills the posterior portion of the visceral cavity, and is composed of large irregular lobules made up almost entirely of eggs, and packed into a dense mass, tapering a little behind and truncated in front. The oviduct (*f*) leaves the anterior border of the ovary as a slender tube, but, almost immediately dilating (*g*), equals the diameter of the testis. This dilated portion of the oviduct rests between the lobes of the mucus-gland, and is at first somewhat sacculated and convoluted; it then passes forward and suddenly contracts (*h*) to its original diameter, and then advances to the anterior border of the mucus-gland and receives the duct from the testis as before described; it then bends a little backward and is shortly joined by a duct (*k*) from the spermatheca. This latter organ (*j*) is a small oval membranous sac, lying between the lobes and at the front margin of the mucus-gland. The duct, which is short and slender, passes from one end of the sac, and, at the point where the duct is united to the oviduct, it is joined by a tube (*m*) which comes from the external orifice immediately within the female opening. This tube is the vagina or copulatory channel, and is cemented to the upper wall of the female channel. Just before the vagina reaches the duct of the spermatheca and oviduct, it gives off a branch which sinks into the female channel, and so far may be looked upon as a portion of the oviduct, for it is by this branch that the eggs find their way to the female outlet.

The mucus-gland (*n, n, n'*), for the secretion of the mucus-like

envelope of the eggs, is composed of two lateral lobes separated on the upper surface by a deep fissure. These lobes are semi-pellucid and are formed of a coarsely convoluted tube; that on the right side having its anterior portion (*n'*) opaque and flesh-coloured. The two lobes open into the female channel (*l*), which is wide and much longer than usual.

The reproductive apparatus, we see, is formed on the type of that of *Eolis*. The mucus-gland is exactly of the same form, and the mode of union of the androgynous parts with the oviduct and testis is the same as in that genus. The only modification of any interest is in connexion with the testis. We know of no other species, in the whole of the *Eolididæ*, in which it is furnished with a distinct vas deferens. In this respect our new genus resembles some of the *Dorides*, particularly *Doris repanda*, in which the testis has appended to it not only a vas deferens but is likewise supplied with a much-constricted duct, which unites it to the oviduct just as in *Oithona*; and the testis, too, of this *Doris* is very similar to the same organ in this animal.

In *Oithona*, then, as in all the Nudibranchs, it is evident, from the connexion of the various parts of the genitalia, that self-impregnation is not only possible but probable; while at the same time it is apparent that the ova may be fertilized by the congress of two individuals.

Vascular and Respiratory Systems.—The vascular system is very interesting in this animal, inasmuch as we have been able to trace the efferent or branchio-cardiac vessels more completely than in any other member of the family. Indeed nearly the whole of these vessels are distinctly visible on the skin of the back, rising above the general surface, and exhibiting a very curious and novel appearance. The heart (Pl. IX. fig. 2 *c*) is situated about the middle of the back, where it forms a large oval swelling immediately below the skin, having the generative organs beneath. From the posterior extremity of the swelling a broad elevated but rounded ridge (*d*) passes down the median line of the back to the termination of the body. This ridge is joined on either side by numerous similarly elevated branches (*e*), which divide and subdivide as they approach the pallial-like expansion on the sides of the body. The whole of these branches and their subdivisions, standing boldly up from the general surface of the skin, have the branchial papillæ set along them (fig. 3 *a*), and they give off twigs, which pass up the margin of the broad, flounced, membranous expansion (*b*) of the papillæ.

On opening the heart from above, the ventricle and auricle are found to occupy a well-defined oval pericardium. The ventricle (Pl. X. fig. 3 *a*) is large and muscular, of an irregular elliptical form, giving off the aorta (*b*) in front, which in the usual

manner supplies branches to the various organs. The auricle (*c*) is united to it behind, a little on the left side; it is delicate in comparison with the ventricle, but is nevertheless abundantly supplied with muscular fibres; it lies diagonally in the pericardium, having the left side advanced almost to the front of that organ where it receives a trunk-vein from the skin. The right side of the auricle stretches backward, and receives a similar trunk-vein from the skin of this side almost at the posterior extremity of the pericardium.

On laying the dorsal wall of the auricle open, its cavity is found to be continuous with that of the great posterior elevated median ridge or trunk-vein (*d*) before alluded to, and on opening this trunk-vein the various lateral branches (*f*) are observed debouching into it on either side. It is therefore evident that this trunk-vein, which lies entirely within the skin, is the great posterior efferent or branchio-cardiac vein, and that all the elevated branches coming to it from the papillæ are also efferent vessels. In this beautiful system of veins, then, we have a clear proof of the branchial character of the papillæ.

The papillæ are, as we are already aware, of a very peculiar character in our animal, being somewhat compressed as in *Eolis papillosa*, and having a distinct, widish, frilled membrane, extending up their inner margin. It is, as before remarked, to the border of this membrane that the twigs of the efferent vessels are given, and they pass up its entire length. Of this there can be no doubt, for we succeeded in forcing a creamy fluid which pervaded these vessels almost to the top of the membrane. When a transverse section of a papilla is made, a widish canal (fig. 8 *b*) is seen to pass up the opposite margin. This may be looked upon as an afferent branchial vein, and deteriorated blood, passing from the skin up this canal, may be supposed to filter through the cellular tissue (*d*) between the external skin and the glandular sheath of the papilla, and so find its way to the vessel (*c*) at the free border of the membrane. If this view be correct, and it would seem scarcely possible to doubt it, the papillæ are evidently specialized breathing organs, and by no means so low in organization as has been thought.

At the same time, from the arrangement of the efferent vessels, from their elevation above the general surface of the skin, thus exposing to the influence of the surrounding medium nearly three-fourths of their circumference, it is pretty clear that the dorsal skin itself must act, to some extent, as a gill, especially when we consider further, that the whole of the blood returned to the heart does not pass through the papillæ: much of it, no doubt, circulating in the spongy tissue of the skin, passes at once into the efferent vessels; and, indeed, small orifices for this pur-

pose are seen in the wall of the great median trunk-vein. Here then, as in *Doris*, the blood is partly aërated in specialized breathing organs, and partly in the skin. In this respect also our animal resembles *Eolis*, in which some time ago, we, in conjunction with Dr. Embleton*, described the existence of two canals, passing up the margins of the papillæ, much in the same manner as in this animal, and then pointed out the fact as evincing the probability of a system of veins, such as the anatomy of *Oithona* has brought to light.

We have not been able to carry our investigations of the vascular system further; but from what we know, we cannot doubt that the peripheral portion of it is made up of lacunæ as is usual in the Mollusca, and probably to the same extent as in the other *Eolididæ*.

In connexion with the vascular system, *Oithona* is provided with an additional propelling organ similar to what in *Doris* we have called a portal heart. As in that genus, this propelling organ (Pl. X. fig. 1 *s*, and fig. 3 *e*) lies below the floor of the pericardium, and in like manner opens into that organ. In this species it is considerably elongated, with the ends rounded, and is placed far back on the right side of the pericardium. It is firmly attached to the skin of the body, and is internally longitudinally plicated. Judging from our knowledge of this heart in the *Dorides*, it may be supposed to throw venous blood from the pericardial cavity to the glands of the papillæ. In *Oithona* it is certainly connected with the skin, and probably has some relationship to the vascular apparatus therein.

In this genus a renal organ probably exists, though we have failed to detect it. A distinct small orifice (Pl. IX. fig. 2 *b*, and Pl. X. fig. 1 *t*), however, opens externally immediately above the anus, and close to the posterior border of the heart. We traced this orifice through the skin, but could not observe its connexion with any internal organ; yet there can be little doubt that it is of the same nature as the minute opening by the side of the anus in *Doris*, and which in that genus leads into an extensive renal apparatus. We have not observed a similar orifice in any other species of the *Eolididæ*.

Nervous system.—The cerebral ganglia resemble those of *Doris* rather than of *Eolis*. They are placed at the commencement of the gullet; there are as usual four pairs of supra-œsophageal ganglions, though at first sight only three are apparent,—the cerebroid (Pl. X. fig. 4 *a*, *a*) and branchial (*b*, *b*) being completely fused. These latter form two oval central masses, resting upon the upper surface of the gullet, one on each side of the median

* Ann. Nat. Hist., 2nd Ser., vol. i. p. 101.